CHEMICAL HAZARD SUMMARY
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SODIUM CHROMATE

(CAS 7775-11-3)

SCOPE OF THE DOCUMENT

This document is aimed at the workplace and describes the toxicity, fire and explosion hazards and reactivity of sodium chromate. It presents procedures for first aid, exposure control, storage, handling, spills and leaks.

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TABLE OF CONTENTS

I.	MAIN CONCERNS	1
II.	OCCUPATIONAL EXPOSURE	1
III.	HEALTH HAZARDS	1
	Elimination From the Body	1
	Effects of Short-Term Exposure in Humans	1
	Effects of Long-Term Exposure in Humans	2
	Cancer-Causing Effects	3
	Toxicity Data in Animals and Laboratory Tests	3
	Other Animal Data	3
IV.	FIRE AND EXPLOSION HAZARDS	4
V.	CHEMICAL REACTIVITY	4
VI.	EXPOSURE LIMITS	4
VII.	EXPOSURE CONTROL	4
	Engineering Controls	4
	Respiratory Protection	5
	Eye/Face Protection	6
	Skin Protection	6
VIII.	STORAGE AND HANDLING	6
IX.	FIRST AID	6
	Inhalation	6
	Eye Contact	7
	Skin Contact	7
	Ingestion	7
	Additional Comments	7
X.	CLEAN-UP AND DISPOSAL	7
XI.	REFERENCES	9

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I. MAIN CONCERNS

Contact with sodium chromate can severely irritate skin and mucous membranes. It can also cause skin allergy.

Chromium compounds can be of two types: trivalent chromium [or chromium (III)], and hexavalent chromium [or chromium (VI)]. Trivalent chromium compounds are usually insoluble, while hexavalent chromium compounds can be soluble or insoluble. Soluble chromium (VI) compounds are generally more acutely toxic than insoluble ones such as lead chromate or barium chromate.

Sodium chromate is a light yellow solid. It may be odourless or have a slight vinegar odour. Its solutions are mildly caustic (basic). Sodium chromate is a soluble chromium (VI) compound and is most often used as a solution in water.

Some chromium (VI) compounds cause cancer. There is not enough evidence to say whether sodium chromate can cause cancer.

II. OCCUPATIONAL EXPOSURE

Sodium chromate is used mainly as a corrosion inhibitor for iron, as a pigment in paints and inks, as a starting material in the manufacture of other chromates and as a wood preservative. It is also used in dyeing and leather tanning processes.

The main routes of occupational exposure are skin contact and inhalation of dusts or mists.[1]

General information on routes of exposure is available in the CCOHS publication "How Workplace Chemicals Enter the Body."[2]

III. HEALTH HAZARDS

Elimination From the Body

Once in the body, some of the sodium chromate is transformed into less toxic chromium (III) compounds. Most sodium chromate is removed rapidly from the body in the urine, but small quantities can be stored in the liver, kidney, and bones.

Effects of Short-Term Exposure in Humans

Inhalation

Sodium chromate dust can cause severe irritation of the nose, throat and lungs.[1]

Eyes

Contact with sodium chromate dust or concentrated solutions of sodium chromate can cause irritation and in severe cases, damage to the outer surface of the eye lens (the cornea).[3]

Skin

Sodium chromate can irritate the skin. It can penetrate intact skin and damage the kidneys.[1]

Ingestion

Ingestion of large quantities of sodium chromate is unusual and unlikely. Doses of 50-80 mg can cause severe inflammation of the stomach, intestines and kidneys.[4] Ingestion of doses around 300 mg may be lethal.[1]

Effects of Long-Term Exposure in Humans

Respiratory System

Repeated or prolonged inhalation of sodium chromate dusts or mists can cause ulceration and perforation of the wall separating the nostrils (nasal septum). The perforation is sometimes called "chrome hole." Chronic inflammation of the nose (rhinitis) and of the throat (pharyngitis) can also occur.

Skin

Repeated or prolonged skin contact with sodium chromate can cause a condition known as "chrome" ulcers. These ulcers are painful, slow-healing holes in the affected skin. Sodium chromate exposure can also cause a sensitization of the skin, known as allergic dermatitis. This means that once a person is sensitized to sodium chromate, further exposure even to very low levels will cause an allergic reaction. This type of reaction is marked by reddening, itching and swelling of the skin.

Digestive System

Long-term exposure to chromium (VI) salts has resulted in stomach cramps, nausea and stomach ulcers. Inflammation of the intestine and colon have also been reported.[1]

Blood

Exposure to chromium (VI) salts can affect the blood by increasing clotting and decreasing the activity of the white blood cells.[1]

Kidney

Long-term exposure to sodium chromate can damage the kidneys.[1]

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Reproductive Effects

There are no specific studies of the effects of sodium chromate on reproduction. In general, only very small amounts of chromium (VI) salts cross the placental barrier and reach the fetus.[5] No effects on the fetus or newborn babies have been reported.

Effects on Genetic Material

There is some evidence that chromium (VI) compounds can cause changes in the chromosomes of white blood cells and lung cells of exposed workers.[5] This evidence indicates that chromium (VI) salts may have a damaging effect on the genetic material of some cells. The significance of these findings for human health is unknown.

Cancer-Causing Effects

It is not yet established whether all chromium (VI) compounds can cause cancer. Some insoluble chromium (VI) compounds such as calcium chromate and zinc chromate, are regarded as potential cancer-causing agents in humans. Soluble chromium (VI) compounds (such as sodium chromate) do not seem to cause cancer in humans but some researchers believe that all chromium compounds have the potential to cause cancer.[6]

The International Agency for Research on Cancer (IARC) states that the available data are not sufficient to determine whether sodium chromate can cause cancer or not.

Toxicity Data in Animals and Laboratory Tests

Lethal Dose Values

LD stands for lethal dose. The LD_{Lo} is the amount of a chemical (weight of chemical per weight of animal) necessary to kill at least one animal in the experiment. Test animals are usually rats, mice or other rodents. Routes of exposure are usually by mouth (oral), through the skin (dermal), through injection into body cavities (intraperitoneal) or by breathing in the airborne chemical (inhalation). The value obtained for this chemical is

LD_{Lo} (guinea pig, dermal): 206 mg/kg

According to the Workplace Hazardous Materials Information System (WHMIS) criteria, this chemical is classified as "Toxic" (Division 2) because of its irritating and skin-sensitizing potential.[7]

Other Animal Data

Effects on Genetic Material

Sodium chromate caused changes in the genetic material of bacteria and isolated mammalian cells in short-term tests.[8]

Cancer-Causing Effects

Several studies of animals exposed to sodium chromate, pure or in a mixture of different chromium (VI) salts, reported either no increase in tumours or lung tumours in a small percentage of the animals.[5]

IV. FIRE AND EXPLOSION HAZARDS

Sodium chromate is neither combustible nor flammable, but it is an oxidizing agent that increases the intensity of a fire, if it comes in contact with materials that can burn. In a fire, sodium chromate can emit very toxic and corrosive fumes of chromic acid and chromium oxides. Therefore special precautions, such as wearing an appropriate respirator, must be taken when fighting a fire involving sodium chromate.

V. CHEMICAL REACTIVITY

Sodium chromate is normally stable, but it can react violently or explosively when it comes into contact with acetic anhydride, hydrazine, or combustible, organic or other readily oxidizable materials. In strong acid solutions, sodium chromate is a strong oxidizer.

VI. EXPOSURE LIMITS

Many Canadian jurisdictions have exposure limits similar to those proposed by the American Conference of Governmental Industrial Hygienists (ACGIH). The following exposure limit has been recommended by ACGIH for water soluble chromium (VI) salts:

Eight-hour/time-weighted average: 0.05 mg/m^3 (milligrams per cubic metre)

Contact the appropriate authority in your jurisdiction for details of the specific regulations which apply. Refer to ACGIH documentation for information on how this exposure limit was set.[8]

VII. EXPOSURE CONTROL

Engineering Controls

To reduce hazardous situations, engineering control methods are preferred. These methods may include mechanical ventilation (dilution and local exhaust), process or personnel enclosure, control of process conditions and process modifications. Administrative controls and personal protective equipment may also be required.

Because of the high potential hazard associated with this substance, stringent control measures such as process enclosure or isolation, are necessary in addition to local exhaust ventilation. Use a corrosion-resistant ventilation system separate from other ventilation systems, with the contaminated air exhausted

directly to the outside (do not recycle). Filtering of exhaust air to remove sodium chromate may be required. Supply sufficient replacement air to make up the air removed by the exhaust ventilation systems.

In some work situations, engineering controls and work practices may not be effective in controlling exposure to sodium chromate. In such cases, suitable personal protective equipment, including respiratory protective devices, should be worn. In addition, appropriate protective equipment should be available in case of emergencies such as spills or fire.

Respiratory Protection

If respiratory protection is required, institute a complete respiratory protection program. This program must include selection, fit testing, training, maintenance and inspection. In such cases, refer to the CSA Standard Z94.4-M1982, "Selection, Care, and Use of Respirators."

The US National Institute for Occupational Safety and Health (NIOSH) has recommended the following respiratory protection for soluble chromate particulate concentrations:

UP TO 0.25 mg/m^3: Any dust and mist respirator except single-use and quarter-mask respirators;* or any supplied-air respirator (SAR); or any self-contained breathing apparatus (SCBA).*

UP TO 0.625 mg/m^3: Any powered air-purifying respirator with a high-efficiency particulate filter;* or any SAR operated in a continuous-flow mode.*

UP TO 1.25 mg/m^3: Any air-purifying full facepiece respirator with a high-efficiency particulate filter; or any powered air-purifying respirator with a tight-fitting facepiece and high-efficiency particulate filter;* or any SCBA with a full facepiece; or any SAR with a full facepiece.

UP TO 25 mg/m^3: Any SAR with a half mask and operated in a pressure-demand or other positive pressure mode.*

UP TO 50 mg/m^3: Any SAR with a full facepiece and operated in a pressure-demand or other positive pressure mode.

EMERGENCY OR PLANNED ENTRY IN UNKNOWN CONCENTRATION OR IDLH** CONDITIONS: Any SCBA with full facepiece and operated in a pressure-demand or other positive pressure mode;* or any SAR with a full facepiece and operated in pressure-demand or other positive pressure mode in combination with an auxiliary SCBA operated in pressure-demand or other positive pressure mode.

* Substance causes eye irritation or damage. Eye protection may be required.

** IDLH (Immediately Dangerous to Life or Health): For the purpose of respirator selection, IDLH concentration is defined as the maximum concentration from which one could escape within 30 minutes without any escape-impairing symptoms or irreversible health effects. NIOSH has established an IDLH level of 30 mg/m^3 for non-carcinogenic chromium (VI) compounds such as sodium chromate.

ESCAPE: Any air-purifying full facepiece respirator with a high-efficiency particulate filter; or any appropriate escape-type SCBA.

The above recommendations apply only to NIOSH/MSHA (Mine Safety and Health Administration) approved respirators.

Air-purifying respirators do not protect against oxygen-deficient atmospheres.

Eye/Face Protection

Wear chemical safety goggles to avoid contact with the dust or mist. In addition, a face shield may be necessary.

Skin Protection

Since sodium chromate can cause severe damage to the skin and can penetrate the body through intact skin, impervious protective clothing is normally necessary. Wear gloves, coveralls and boots made of neoprene or polyvinyl chloride (PVC) when working with sodium chromate.

Note that the resistance of specific materials can vary. Evaluate the resistance of specific materials under working conditions. Maintain and check protective clothing regularly.

VIIi. STORAGE AND HANDLING

Store sodium chromate in a cool, dry, well-ventilated area, out of direct sunlight, and away from incompatible materials and heat. Store this chemical in non-corrodible, labelled containers, and keep them tightly closed when not in use or when empty. Protect the containers from damage. Limit the quantity of chemical stored and limit access to the storage area to authorized personnel. Post warning signs indicating the potential hazards of sodium chromate. Use a separate storage area away from working areas. Inspect the storage area periodically for problems such as damage to containers and leaks. Store sodium chromate away from organic, flammable, combustible, corrosive or toxic materials. Containers which have contained sodium chromate may be hazardous due to residual material.

Wear appropriate personal protective equipment when using sodium chromate. Avoid generating mists or dust. Use dust-tight containers when working with this chemical.

IX. FIRST AID

The following general procedures are recommended in case of exposure to sodium chromate.

Inhalation

If symptoms such as irritation are experienced, remove the source of exposure or remove the victim to fresh air. Obtain medical advice immediately. If the victim has difficulty breathing, the administration of oxygen by a qualified person may be beneficial, preferably on a physician's advice.

Eye Contact

Flush the contaminated eye immediately with lukewarm, gently flowing water for at least 20 minutes, holding the eyelid open. Be careful not to rinse the contaminated water into the non-affected eye. If irritation persists, repeat flushing and obtain medical attention immediately.

Skin Contact

Wash the contaminated area of the skin as quickly as possible with lukewarm, gently flowing water for at least 20 minutes. Under running water, remove all contaminated clothing, shoes and leather goods such as watchbands or belts. If irritation persists, obtain medical attention immediately.

Ingestion

Never give anything by mouth if the victim is unconscious, rapidly losing consciousness or convulsing. Do not induce vomiting. Rinse the victim's mouth thoroughly with water and have the victim drink 240 to 300 ml (8 to 10 oz) of water to dilute sodium chromate in the stomach. If the victim vomits naturally, rinse the mouth again and repeat the administration of water. Transport the victim to an emergency facility as quickly as possible.

Additional Comments

Only adequately trained personnel should perform rescues and first aid procedures. A physician or the nearest Poison Control Centre should be consulted for all exposures except minor instances of inhalation or skin contact. All first aid procedures should be reviewed periodically by a physician familiar with sodium chromate and its conditions of use in the workplace.

Decontaminate clothing, shoes and other leather goods completely before reuse, or discard. Notify laundry personnel of the nature of the hazards.

X. CLEAN-UP AND DISPOSAL

Prepare an emergency action plan in advance. Provide appropriate training for emergencies such as clean-up. Have emergency equipment readily available and in good working order. Restrict the emergency area to authorized personnel until clean-up is completed. Supply clean-up personnel with adequate personal protective equipment. Ventilate the area and remove or isolate any flammable or combustible materials.

Shovel solid sodium chromate into clean, dry, non-corrodible containers. Label and cover the containers awaiting disposal.

Stop or reduce leaks of sodium chromate solution if it is safe to do so. Contain the spilled material with sand, earth or any absorbent material which does not react with sodium chromate. Take the necessary precautions so that the solution does not enter sewers.

Soak up small spills with absorbent material. Put the contaminated absorbent into a suitable, covered and labelled container. Flush the area with plenty of water.

Contain large spills with earth, sand, or other inert material. Contact fire and emergency services. Notify the appropriate government occupational health and safety or environmental agencies. If in need of further assistance, contact the supplier.

Note: The contaminated absorbent material may pose the same hazards as the spilled product.

Review all federal, provincial and local government requirements prior to disposal. Chemical treatment of chromium wastes may be required prior to disposal. Contact the manufacturer or the supplier of the chemical for advice.

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Note: Additional references on this subject are available from CCOHS upon request.

PLEASE NOTE

This summary was prepared at the Canadian Centre for Occupational Health and Safety (CCOHS) and is intended primarily as a source of information for persons who work with or may be occupationally exposed to this material. The information selected for inclusion is believed to be reliable and generally relevant to occupational health. Other information which bears on particular work situations may be available. The scientific data in many areas are limited and may allow a variety of interpretations. Additional information, corrections, comments and questions are welcome, and should be addressed to the Inquiries Service, CCOHS, 250 Main Street East, Hamilton, Ontario, L8N 1H6, (416) 572-2981; toll free 1-800-263-8276.

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